COMPOSITE PHASE DIFFERENCE PLATE, OPTICAL COMPENSATION POLARIZING PLATE AND LIQUID CRYSTAL DISPLAY DEVICE

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Inventor: NISHIKOJI YUICHI; YOSHIMI HIROYUKI
Applicant: NITTO DENKO CORP

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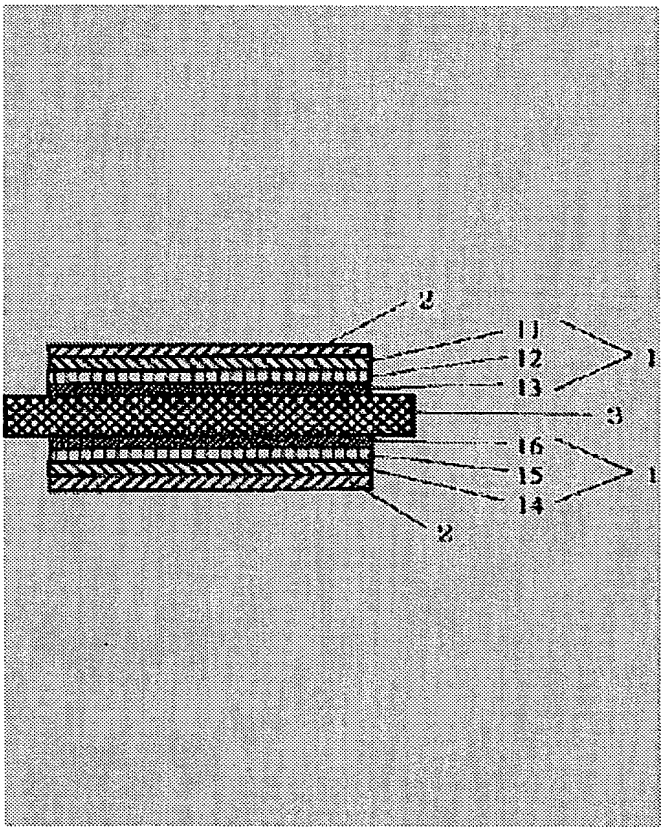
Abstract of **JP2001215329**

PROBLEM TO BE SOLVED: To develop a phase difference plate enabling to form a liquid crystal display device capable of highly compensating the phase difference by double refractivity of a TN liquid crystal even in the case of a large-sized screen, and excellent in the angle of view of good visual recognition. SOLUTION: A composite phase difference plate 1 consists of laminates having one layer or two or more layers of (A) phase difference layers 11 and 14 of nx>=ny>=nz, when the refractive index of the thickness direction and intra-plane is set to nx, ny, and nz and the thickness to d, nx-ny=&Delta nxy, and (nx-nz)/&Delta nxy=Q, (B) phase difference layers 12 and 15 whose optical axis is inclined when nx>=ny>=nz and (C) phase difference layers 13 and 16 of &Delta nxy.d<=70 nm, and 1<=Q<=4 consisting of norbornene oriented film, respectively. When the refractive index of the thickness direction within the surface of the laminate is set to Nx, Ny, and Nz and the thickness to D, Nx>=Ny, (Nx-Ny)=&Delta Nxy, and (Nx+Ny)/2-Nz}.D=Rth, &Delta Nxy.D on the basis of monochromatic light with a wavelength of 590 nm is 25 to 100 nm, and Rth is 100 to 300 nm, and the angle &beta formed by a normal and Nz to the laminate surface is 5 to 30 deg..



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the compound presentation phase differential plate and optical compensation polarizing plate which can form the liquid crystal display which compensates altitude for the birefringence by TN liquid crystal, and is excellent in an angle of visibility or contrast.
[0002]
[Description of the Prior Art] The inside where its attention is paid by high-speed responsibility and the high contrast nature in the direction of a transverse plane, and TFT-LCD (liquid crystal display) using TN liquid crystal spreads through television, a personal computer monitor, etc. widely, The improvement of the straitness of the right check-by-looking angle of visibility by the remarkable fall of the contrast in the direction of strabism, reversal (tone reversal) of a gradation display, etc. is called for, and control of a raise in contrast, or wide-field-of-view cornification and the foreground-color change by the angle of visibility and equalization of a screen display have been an important technical problem especially with enlargement of a screen.
[0003] The proposal which compensates the phase contrast by the birefringence of TN liquid crystal with a phase contrast plate as the aforementioned remedy, and expands an angle of visibility conventionally is made. the wide view film (a trade name --) in which the negative refractive-index anisotropy which consists of discotheque liquid crystal of an optical-axis inclination as a compensating plate for the angle-of-visibility expansion is shown NH film (a trade name --) in which the forward refractive-index anisotropy which consists of Fuji Photo Film Co., Ltd. make or a nematic liquid crystal of an optical-axis inclination is shown the compensating plate (JP,7-306406,A --) of the superposition mold which carried out the laminating of the phase contrast plate which consists of an uniaxial stretched film by the polymer which shows the Nippon Oil chemistry company make and a forward birefringence property so that those refractive-index directions might intersect perpendicularly in the combination of what has the optical axis in a field, and the thing which inclined to the field JP,7-35924,A and JP,10-123506,A were known.
[0004] However, with the aforementioned wide view film, contrast fell remarkably with the angle of visibility which inclined 60 degrees or more from the transverse plane, and there was a trouble which a coloring phenomenon generates in the state of the white display which does not impress an electrical potential difference. Moreover, with NH film, when the angle of visibility was changed in the state of the black display which impressed the electrical potential difference, it discolored and there was a trouble which becomes less black. In the further aforementioned superposition mold compensating plate, there was a trouble which a remarkable coloring phenomenon generates in change of an angle of visibility. Therefore, in the conventional compensating plate, the phase contrast property of TN liquid crystal could not fully be coped with, but there was a trouble cannot be satisfied with an improvement of the check-by-looking property of a trouble.
[0005]
[The technical technical problem of invention] This invention aims at development of the phase contrast

plate which can form the liquid crystal display which is excellent in the angle of visibility and contrast which can compensate altitude for the phase contrast also by the birefringence of TN liquid crystal or case of a large-sized screen, and do not carry out tone reversal, and is excellent in the control of foreground-color change and the homogeneity of a screen display by the angle of visibility.
[0006]
[Means for Solving the Problem] When this invention sets the refractive index of nx, ny, and the thickness direction to nz and sets thickness to d, nx-ny=**nxy, and (nx-nz)/(nx-ny)=Q for the refractive index within a field, (A) The phase contrast layer which consists of a high polymer film which satisfies nx>ny>nz, (B) It consists of an oriented film of the phase contrast layer toward which nx>=ny>nz is satisfied and an optical axis inclines to the direction of a normal of a layer flat surface, and (C) norbornene system polymer. **nxy-d<=70nm, It consists of a layered product which has the phase contrast layer with which are satisfied of 1<=Q<=4 one layer or more than two-layer, respectively. And when the refractive index within the field in the layered product is made into Nx>=Ny, =(Nx-Ny) **Nxy, and {(Nx+Ny) /2-Nz} and D=Rth by setting thickness to D, having set the refractive index of Nx, Ny, and the thickness direction as Nz, The compound presentation phase differential plate characterized by for **Nxy-D based on the homogeneous light with a wavelength of 590nm being 25-100nm, and for Rth being 100-300nm, and the angle beta which the normal to a layered product side and Nz make being 5 - 30 degrees is offered.
[0007] Moreover, the liquid crystal display characterized by having the optical compensation polarizing plate characterized by this invention consisting of a layered product of the aforementioned compound presentation phase differential plate and an aforementioned polarizing plate and the aforementioned compound presentation phase differential plate between a polarizing plate and a liquid crystal cell is offered.
[0008]
[Effect of the Invention] the ** concerned by compound-izing of the phase contrast which combined (A) of the above-mentioned phase contrast layer, (B), and (C) according to this invention -- by achievement of the phase contrast property of Nxy and Rth The phase contrast plate with which altitude can be compensated for the phase contrast by the birefringence of TN liquid crystal in an omnidirection angle can be obtained. Also in the case of a large-sized screen, the angle of visibility which does not carry out tone reversal is large, a foreground color cannot change to it easily due to an angle of visibility, and the liquid crystal display which is excellent in the homogeneity of contrast or a screen display can be formed.

[0009]
[Embodiment of the Invention] When the compound presentation phase differential plate by this invention sets the refractive index of nx, ny, and the thickness direction to nz and sets thickness to d, nx-ny=**nxy, and (nx-nz)/(nx-ny)=Q for the refractive index within a field, (A) The phase contrast layer which consists of a high polymer film which satisfies nx>ny>nz, (B) The phase contrast layer toward which nx>=ny>nz is satisfied and an optical axis inclines to the direction of a normal of a layer flat surface, It consists of an oriented film of (C) norbornene system polymer. And **nxy-d<=70nm, It consists of a layered product which has the phase contrast layer with which are satisfied of 1<=Q<=4 one layer or more than two-layer, respectively. And when the refractive index within the field in the layered product is made into Nx>=Ny, =(Nx-Ny) **Nxy, and {(Nx+Ny) /2-Nz} and D=Rth by setting thickness to D, having set the refractive index of Nx, Ny, and the thickness direction as Nz, In 25-100nm, **Nxy-D based on the homogeneous light with a wavelength of 590nm is [Rth] 100-300nm, and the angle beta which the normal to a layered product side and Nz make is 5 - 30 degrees.
[0010] The example of said compound presentation phase differential plate was shown in drawing 1 . 1 is the compound presentation phase differential plate which consists of a layered product of a phase contrast layer (A), (B), and (C), and, for 11 and 14, a phase contrast layer (B), and 13 and 16 are [a phase contrast layer (A), and 12 and 15] phase contrast layers (C). In addition, drawing shows what was used as the liquid crystal display, 2 is a polarizing plate and 3 is a liquid crystal cell.

[0011] A phase contrast layer (A) has a refractive-index anisotropy (nx>ny), and is formed in the high polymer film which satisfies nx>ny>nz, i.e., a field, in the high polymer film which shows the refractive-index property (ny>nz) that the refractive index of the thickness direction is smaller than the refractive index within the field. Phase reference:**nxy-d is less than [0 ** -50nm] to the extent that it is based on the homogeneous light with a wavelength of 590nm, and a phase contrast layer (A) more desirable than the point of a compensation effect shows the birefringence property that rth defined by formula: (nx+ny) / 2-nz}-d is 30-100nm. In addition, in the above, the refractive index within a field and nz mean the refractive index of the thickness direction, d means thickness, and nx and ny are **nxy=nx-ny (it is below the same).

[0012] What consists of a proper transparence macromolecule in which the above mentioned refractive-index property is shown as a high polymer film can be used, and there is especially no limitation. Incidentally as the example, the oriented film to which carry out extension processing of the film which consists of various kinds of polymers, or its film by the method with proper one shaft, two shafts, etc., and it comes to carry out orientation of the macromolecule is raised. Above all, it excels in light transmittance and what has few orientation nonuniformity and phase contrast nonuniformity can use preferably.

[0013] As an example of the polymer which incidentally forms said high polymer film, a polycarbonate, polyarylate and polysulfone, polyolefine and polyethylene terephthalate, polyethylenenaphthalate, a norbornene system polymer and an acrylic polymer, a styrene system polymer, the polymer that mixed two sorts, a cellulose system polymer and these polymers, or three sorts or more are raised.

[0014] Moreover, it can be made to serve as the transparent protection layer of a polarization film by forming a phase contrast layer (A) in a high polymer film. the phase contrast layer (A) which forms the compound presentation phase differential plate 1 like the example of drawing 1 -- the thin-shape-izing and shortening of a manufacture process can be attained by considering as the optical compensation polarizing plate which carried out the laminating of the compound presentation phase differential plate 1 and the polarizing plate 2 where 11 and 14 are made to serve as the transparent protection layer of a polarization film.

[0015] A phase contrast layer (B) is formed in that toward which nx>=ny>nz (negative refractive-index anisotropy) is satisfied, and the optical axis inclines to the direction of a normal of a layer flat surface. Compensation over the condition that the optical axis inclined to TN liquid crystal which this shows a forward refractive-index anisotropy, and the cel substrate in the cel in the black display especially by the electrical-potential-difference impression can be performed efficiently. When not satisfying the conditions toward which a phase contrast layer (B) satisfies only a negative refractive-index anisotropy, and an optical axis inclines to the direction of a normal of a layer flat surface, the purpose of this invention cannot be attained.

[0016] namely, in the phase contrast layer with which are satisfied of a negative refractive-index anisotropy When the incident angle of the homogeneous light is leaned in the maximum refractive-index direction within a field from criteria by making the direction of a normal into criteria (zero incident angle), the **nxy-d When it leans in the direction which intersects a symmetry form perpendicularly with nothing and intersects an incident angle perpendicularly with the maximum refractive-index bearing within a field focusing on it by making the case of 0 times incidence into maximum, a symmetry form is made focusing on it by making into the minimum value the case where the **nxy-d is 0 times incidence, and a compensation effect runs short of.

[0017] By adding the property that an optical axis inclines from a normal to the above, it can avoid that **nxy-d serves as maximum and the minimum value at the time of 0 times incidence, and improvement in a compensation effect can be aimed at. In addition, when the inclination type of a negative refractive-index anisotropy makes hybrid orientation, the minimum value of **nxy-d is not set to 0, but when making tilt orientation, the minimum value of **nxy-d may be set to 0.

[0018] Formation of the phase contrast layer (B) which shows the above-mentioned property can be formed as that in which the molecule carried out inclination orientation to the stratification plane with the

method with proper method which carries out rolling processing of the film which consists for example, of a thermoplastic polymer with the roll with which peripheral speed differs, method to which orientation of the liquid crystal polymer is carried out through the bottom of impression of electric field, a magnetic field, etc., or the orientation film.

[0019] In addition, what has the proper thing illustrated in the above-mentioned phase contrast layer (A) as the aforementioned thermoplastic polymer can be used. Moreover, as a liquid crystal polymer, one sort or two sorts or more can be used for what has the proper thing of a disco teak system, a nematic system, a cholesteric system, or a smectic system etc. Above all, the **** disco teak liquid crystal polymer in the wide view film described above from points, such as the processability of inclination orientation, can use preferably.

[0020] A phase contrast layer (C) consists of an oriented film of a norbornene system polymer, and is formed in **nxy-d<=70nm and the thing which satisfies 1<=Q<=4. In addition, it is Q=(nx-nz)/(nx-ny) (it is below the same). Formation of this phase contrast layer (C) can be performed by the approach of carrying out uniaxial stretching for example, of the norbornene system polymer film crosswise by one 1.1 to 3 times the scale factor of this through a tenter etc. at temperature higher 30-60 degrees C than glass transition temperature etc. There is especially no limitation about the norbornene system polymer which forms a phase contrast layer (C), and it is independent in proper things, such as a commercial object, or two or more sorts are mixed and it can use.

[0021] When formation of a compound presentation phase differential plate makes the refractive index within the field in a layered product Nx>=Ny, =(Nx-Ny) **Nxy, and {(Nx+Ny) /2-Nz} and D=Rth by setting thickness to D, having set the refractive index of Nx, Ny, and the thickness direction as Nz, **Nxy-D based on the homogeneous light with a wavelength of 590nm by 25-100nm And (A) of the phase contrast layer described above in the combination from which Rth is set to 100-300nm, (B), and (C) can be performed by carrying out a laminating so that the angle beta which the normal to a layered product side and Nz make may become 5 - 30 degrees. On the occasion of the laminating, said Gentlemen phase reference layer of A, B, and C can be used one layer or more than two-layer, respectively.

[0022] It is also possible to form the TN liquid crystal display in which contrast good without change of a foreground color is shown on the omnidirection square of 80 abbreviation to a normal (the direction of a transverse plane) by satisfying Rth as above **Nxy. It can carry out, when control of Rth changes the combination and its number of combination of (A) of a phase contrast layer, (B), and (C) as the aforementioned **Nxy in a compound presentation phase differential plate.

[0023] In the laminating of (A) of a phase contrast layer, (B), and (C), those lagging axes thru/or a phase leading shaft-configuration include angle, and location sequence are arbitrary, and can adjust above **Nxy and Rth also by control of the arrangement include angle. A more advantageous laminating than the point of a compensation effect is made to cross so that the inclination direction of the optical axis of a phase contrast layer (B) and the maximum refractive-index direction within a layered product side may be in a rectangular condition (90 degrees) as much as possible.

[0024] Moreover, using (A) of a phase contrast layer, (B), and (C), the laminating of the one layer each of the more advantageous laminatings than the point of attaining thin shape-ization of a compound presentation phase differential plate, attaining the aforementioned compensation effect is carried out so that (B) of a phase contrast layer may be located between (A) and (C) in them. In addition, proper adhesives, such as a binder, can be used on the occasion of the laminating of a phase contrast layer, and it is also possible to carry out adhesion support in a phase contrast layer (A) etc. by the liquid crystal polymer layer.

[0025] Like the above, a new phase contrast property can be given by compound-ization by the combination of (A) of a phase contrast layer, (B), and (C), the abundant phase contrast plates in which various kinds of phase contrast properties that the phase contrast by the birefringence of TN liquid crystal, change by the viewing angle, etc. can be compensated are shown can be obtained, and it can compensate with high precision also to a difference of the birefringence property by the difference in the orientation condition of TN liquid crystal etc.

[0026] Like the conventional above-mentioned wide view film and conventional NH film, namely, by (A) of a phase contrast layer, and (B) For example, the point that the contrast in the angle of visibility of 60 degrees or more falls greatly and the point which coloring generates in a white display, Or by compensating a phase contrast layer (C) with the point which discolors by black display and compensation effects, such as a point which becomes less black, run short of, and compensating it with the three-layer phase contrast layer concerned at least, the TN liquid crystal display which is excellent in a large angle of visibility at contrast, the lowness of foreground-color change, etc. can be obtained.
[0027] In addition, the thickness of (A) of a phase contrast layer, (B), and (C) can be suitably determined according to the phase contrast property made into the purpose. When consisting of a high polymer film generally, above all, especially, especially in the case of 5-250 micrometers and a liquid crystal polymer layer, 100 micrometers or less 20 micrometers or less are made into the thickness of 0.1-10 micrometers above all, but 1-500-micrometer 3-350 micrometers are not limited to this.
[0028] Practical use can also be presented with the compound presentation phase differential plate by this invention as it is, like the example of drawing, the laminating of it can be carried out to a polarizing plate 2, and practical use can also be presented with it as an optical compensation polarizing plate. A proper polarizing plate can be used for formation of the optical compensation polarizing plate, and there is especially no limitation in it about the class. Above all, the linearly polarized light of a predetermined plane of vibration is penetrated, and the polarizing plate of the absorption mold in which the property to absorb is shown can use other light more preferably than the point of high degree of polarization etc.
[0029] Incidentally as an example of said polarizing plate, a polarization film, a polarization film of polyene orientation, etc. which dichroism matter, such as iodine and/or dichromatic dye, was made to stick to the film of the hydrophilic macromolecule like a polyvinyl alcohol system, a partial formal-ized polyvinyl alcohol system, and an ethylene-vinylacetate copolymer system partial saponification object, and carried out extension orientation processing are used.
[0030] Moreover, a polarizing plate may be what prepared transparent protection layer in one side or both sides of a polarization film. Transparent protection layer is prepared for the various purpose, such as reinforcement of a polarization film, and thermal resistance, damp-proof improvement. Transparent protection layer can be formed as the spreading layer of resin, a lamination layer of a resin film, etc., and may contain the particles diffusion-izing, for surface roughening, etc. Moreover, transparent protection layer may be prepared as a phase contrast layer (A), as described above.
[0031] the phase contrast layer (A) which forms the compound presentation phase differential plate by this invention like the example of drawing in the aforementioned case -- 11 and 14 will serve as the transparent protection layer of one side of the polarization film in a polarizing plate 2, and are advantageous to thin-shape-izing of an optical compensation polarizing plate, or improvement in the assembly effectiveness of a liquid crystal display. In addition, when the transparent protection layer which prepared the compound presentation phase differential plate in another object shows phase contrast, as for a compound presentation phase differential plate, it is more desirable than points, such as a compensation effect, to satisfy Rth as **Nxy described above as a property in the condition of having added the transparent protection layer which approaches it at least.
[0032] An acid-resisting layer and an anti-glare treatment layer may be prepared for the purpose of prevention of the surface reflection to the side in which further especially the polarizing plate to be used does not prepare a compound presentation phase differential plate etc. An acid-resisting layer can be suitably formed as film of optical coherence, such as a coat layer of for example, a fluorine system polymer, and multilevel-metal vacuum evaporationo film, etc. On the other hand, an anti-glare treatment layer may also be formed by the proper method which the surface reflected light diffuses by giving detailed irregularity structure to a front face etc. by proper methods, such as a resin coating layer of particle content, embossing and sandblasting processing, and etching processing.
[0033] in addition, conductive things, such as the silica whose mean diameter is 0.5-20 micrometers at the aforementioned particle, a calcium oxide and an alumina, a titania, a zirconia and tin oxide, indium oxide, and cadmium oxide, antimony oxide, -- **** of a certain inorganic system particle,

polymethylmethacrylate, or poly URETA -- proper things, such as an organic system particle for which a bridge is not constructed [the bridge formation which consists of a proper polymer, or], -- one sort -- or two or more sorts can be used.

[0034] About the arrangement relation of a phase leading shaft of a compound presentation phase differential plate, etc. a transparency shaft of a polarizing plate, etc. in an optical compensation polarizing plate, there is especially no limitation and it can be determined suitably. It is more desirable than the point of arranging the maximum refraction direction within a field of the transparency shaft of a polarizing plate and a compound presentation phase differential plate to parallel relation or orthogonality relation generally controlling the property of the direction of slant that a viewing angle changes without affecting the property of the direction of a transverse plane (perpendicular), and aiming at expansion of an angle of visibility etc.

[0035] Although each class which forms the compound presentation phase differential plate and optical compensation polarizing plate by this invention, such as a phase contrast layer and a polarizing plate, may be in a separation condition, it is more desirable than points, such as invasion prevention of foreign matters, such as control of reflection by the refractive-index difference accommodation between layers, gap prevention of optical system, and dust, the part and that fixing processing of all is carried out above all.

[0036] Proper things, such as transparent adhesives, can be used for the aforementioned fixing processing, for example, and there is especially no limitation in it about the class of adhesives etc. What does not require a hot process in the case of hardening at the time of adhesion processing or desiccation is desirable, and what does not require hardening processing or the drying time of long duration is more desirable than points, such as change prevention of the optical property of a configuration member. Rather than this point, an adhesive layer can use preferably.

[0037] The transparence binder which comes to use proper polymers, such as for example, an acrylic polymer, a silicone system polymer and polyester, polyurethane and a polyether, and synthetic rubber, can be used for formation of an adhesive layer. Above all, an acrylic binder is more desirable than points, such as optical transparency, and an adhesion property, weatherability.

[0038] In addition, an adhesive layer can also be prepared in one side or both sides, such as a compound presentation phase differential plate and an optical compensation polarizing plate, if needed for the purpose of adhesion to adherends, such as a liquid crystal cell. It is desirable to install a separator etc. tentatively and to prevent contamination on the front face of an adhesive layer etc. until it presents practical use with it, when an adhesive layer is exposed to a front face.

[0039] The compound presentation phase differential plate and optical compensation polarizing plate by this invention can be preferably used for formation of a liquid crystal display as a compensating plate to the birefringence by liquid crystal, especially TN liquid crystal etc. Although a liquid crystal display is formed by assembling suitably component parts, such as a polarizing plate, a liquid crystal cell, a compensating plate, and a back light as occasion demands, a reflecting plate, generally, and incorporating a drive circuit etc., except for the point using the compound presentation phase differential plate and optical compensation polarizing plate which were described above in this invention, there is especially no limitation and it can form a liquid crystal display according to the former.

[0040] Therefore, on the occasion of formation of a liquid crystal display, proper optical elements, such as optical-path control strips, such as a prism sheet prepared in the optical diffusion plate and anti glare layer which are prepared, for example on the polarizing plate by the side of a check by looking, a prism sheet and the antireflection film, a protective layer, a guard plate, and a back light, can be arranged suitably. In addition, a compensating plate is usually arranged like the example of drawing between the polarizing plates 2 by the side of a liquid crystal cell 3, a check by looking, or/and a back light. Therefore, the compound presentation phase differential plate or optical compensation polarizing plate by this invention should just be arranged at one side, even if there are few liquid crystal cells.

[0041]

[Example] Extension processing of the norbornene system polymer film (it is the same the product made

from JSR, ATON, and the following) with an example 1 thickness of 100 micrometers is carried out at 175 degrees C by the tenter drawing machine, it has the refractive-index property of nx>ny>nz, and **nxy-d by the homogeneous light with a wavelength of 590nm (it is below the same) obtained the phase contrast layer A1 whose rth is 80nm by 10nm. In addition, the refractive index etc. was measured with the automatic birefringence plan (it is the same the Oji measuring machine machine company make, KOBRA-21ADH, and the following).

[0042] Next, only the inclination orientation layer of the disco tic liquid crystal polymer of a wide view film (WV02A) was imprinted by the method which carries out transfer through adhesives on the aforementioned phase contrast layer A1 under humidification processing, the laminating of the phase contrast layer B1 was carried out, and **nxy-d by the homogeneous light with a wavelength of 590nm obtained the layered product whose rth is 130nm by 30nm. In addition, on the occasion of the imprint laminating, it processed so that the direction of the maximum refractive index within a field of the phase contrast layer A1 (nx) and the inclination direction of disco tic liquid crystal might become parallel.

[0043] Subsequently, Q carried out the laminating of the phase contrast layer C1 of 1.6 through the acrylic adhesive layer by 20nm, and **Nxy-D by the homogeneous light with a wavelength of 590nm obtained [**nxy-d by the homogeneous light with a wavelength of 590nm which carried out uniaxial-stretching processing and obtained the norbornene system polymer film with a thickness of 100 micrometers at 210 degrees C by the tenter on the aforementioned phase contrast layer B1] the compound presentation phase differential plate whose Rth is 160nm by 50nm.

[0044] Next, after dyeing a polyvinyl alcohol film with a thickness of 75 micrometers in the water solution containing iodine, A triacetyl cellulose film with a thickness of 80 micrometers is pasted up on one side of the polarization film which increased [the film] uniaxial stretching 6 times and was obtained between the rolls with which peripheral speed differs through polyvinyl alcohol system adhesives in the water solution containing a boric acid. on the other hand, the polarization film was alike, the adhesion laminating of the aforementioned compound presentation phase differential plate was carried out through the phase contrast layer A1 through polyvinyl alcohol system adhesives, and the optical compensation polarizing plate was obtained.

[0045] Replaced with the example compound presentation phase differential plate of a comparison, and the adhesion laminating was carried out through the phase contrast layer A1 using the layered product of the above-mentioned phase contrast layer A1 and the above-mentioned phase contrast layer B1, and also the optical compensation polarizing plate was obtained according to the example 1.

[0046] The optical compensation polarizing plate obtained in the evaluation trial example 1 and the example of a comparison was pasted up so that a polarizing plate might serve as an outside to both sides of a TN liquid crystal cel, the liquid crystal display was obtained, and the contrast measuring instrument (the product made from ELDIM, EZContrast) investigated the angle-of-visibility property of the display contrast. The contrast [result / the] curve showed to drawing 2 . Moreover, the angle-of-visibility property of contrast 10 criteria of the direction of four directions was shown in degree table. It turns out that the angle of visibility of a right check by looking is mostly expanded greatly in an omnidirection from the above result in an example.

[0047]

Above Down Left Right Example 1 80 degrees or more 50 degrees 80 degrees or more 80 degrees or more Ratio ** Example 52 degrees 52 degrees 60 degrees 63 degrees

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The sectional view of the example of a liquid crystal display
[Drawing 2] Contrast curve, such as an example 1 and an example of a comparison
[Description of Notations]
1: Compound presentation phase differential plate
11 14: Phase contrast layer (A)
12 15: Phase contrast layer (B)
13 16: Phase contrast layer (C)
2: Polarizing plate
3: Liquid crystal cell

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CLAIMS

[Claim(s)]
[Claim 1] When the refractive index of nx, ny, and the thickness direction is set to nz and thickness is set to d, nx-ny=**nxy, and (nx-nz)/(nx-ny)=Q for the refractive index within a field, (A) The phase contrast layer which consists of a high polymer film which satisfies nx>ny>nz, (B) It consists of an oriented film of the phase contrast layer toward which nx>=ny>nz is satisfied and an optical axis inclines to the direction of a normal of a layer flat surface, and (C) norbornene system polymer. **nxy-d<=70nm, It consists of a layered product which has the phase contrast layer with which are satisfied of 1<=Q<=4 one layer or more than two-layer, respectively. And when the refractive index within the field in the layered product is made into Nx>=Ny, =(Nx-Ny) **Nxy, and {(Nx+Ny) /2-Nz} and D=Rth by setting thickness to D, having set the refractive index of Nx, Ny, and the thickness direction as Nz, The compound presentation phase differential plate characterized by for Rth being [for **Nxy-D based on the homogeneous light with a wavelength of 590nm] 100-300nm in 25-100nm, and the angle beta which the normal to a layered product side and Nz make being 5 - 30 degrees.
[Claim 2] The optical compensation polarizing plate characterized by consisting of a layered product of a compound presentation phase differential plate and a polarizing plate according to claim 1.
[Claim 3] The liquid crystal display characterized by having a compound presentation phase differential plate according to claim 1 between a polarizing plate and a liquid crystal cell.
[Claim 4] The liquid crystal display in claim 3, a compound presentation phase differential plate has a phase contrast layer (B) between a phase contrast layer (A) and a phase contrast layer (C), and using (A) of a phase contrast layer, (B), and (C) one layer each.

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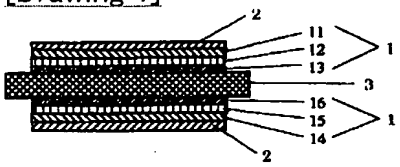
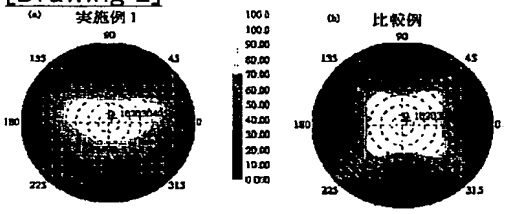
DRAWINGS

[Drawing 1]



[Drawing 2]



[Translation done.]

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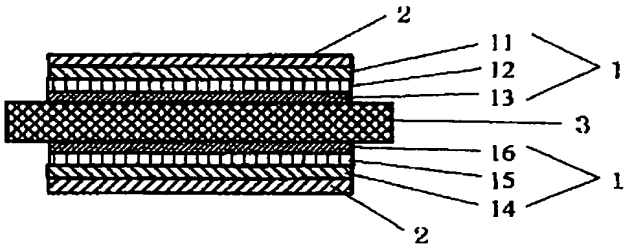
(71)出願人　000003964
日東電工株式会社
大阪府茨木市下穂積１丁目１番２号
(72)発明者　西小路　祐一
大阪府茨木市下穂積１丁目１番２号日東電工株式会社内
(72)発明者　吉見　裕之
大阪府茨木市下穂積１丁目１番２号日東電工株式会社内
(74)代理人　100088007
弁理士　藤本　勉

最終頁に続く

(54)【発明の名称】　複合位相差板、光学補償偏光板及び液晶表示装置

(57)【要約】
【課題】　大型画面の場合にもＴＮ液晶の複屈折による位相差を高度に補償できて良視認の視野角に優れる液晶表示装置を形成できる位相差板の開発。
【解決手段】　面内、厚さ方向の屈折率をｎｘ、ｎｙ、ｎｚ、層厚をｄ、ｎｘ－ｎｙ＝△ｎｘｙ及び（ｎｘ－ｎｚ）／△ｎｘｙ＝Ｑとしたとき（Ａ）ｎｘ＞ｎｙ＞ｎｚの位相差層(11,14)、（Ｂ）ｎｘ≧ｎｙ＞ｎｚで光学軸が傾斜した位相差層(12,15)及び（Ｃ）ノルボルネン系配向フィルムからなり△ｎｘｙ・ｄ≦７０ｎｍ、１≦Ｑ≦４の位相差層(13,16)をそれぞれ１層又は２層以上有する積層体（１）からなり、その積層体の面内、厚さ方向の屈折率をＮｘ、Ｎｙ、Ｎｚ、厚さをＤ、Ｎｘ≧Ｎｙ、（Ｎｘ－Ｎｙ）＝△Ｎｘｙ及び｛（Ｎｘ＋Ｎｙ）／２－Ｎｚ｝・Ｄ＝Ｒthとしたとき、波長５９０ｎｍの単色光に基づく△Ｎｘｙ・Ｄが２５～１００ｎｍで、Ｒthが１００～３００ｎｍであり、かつ積層体面に対する法線とＮｚのなす角βが５～３０度である複合位相差板（１）。



1

【特許請求の範囲】

【請求項１】　面内の屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚ、層厚をｄ、ｎｘ－ｎｙ＝△ｎｘｙ及び（ｎｘ－ｎｚ）／（ｎｘ－ｎｙ）＝Ｑとしたとき、（Ａ）ｎｘ＞ｎｙ＞ｎｚを満足する高分子フィルムからなる位相差層、（Ｂ）ｎｘ≧ｎｙ＞ｎｚを満足し光学軸が層平面の法線方向に対し傾斜する位相差層及び（Ｃ）ノルボルネン系ポリマーの配向フィルムからなり△ｎｘｙ・ｄ≦７０ｎｍ、１≦Ｑ≦４を満足する位相差層をそれぞれ１層又は２層以上有する積層体からなり、かつその積層体における面内の屈折率をＮｘ、Ｎｙ、厚さ方向の屈折率をＮｚ、厚さをＤとしてＮｘ≧Ｎｙ、（Ｎｘ－Ｎｙ）＝△Ｎｘｙ及び｛（Ｎｘ＋Ｎｙ）／２－Ｎｚ｝・Ｄ＝Ｒｔｈとしたとき、波長５９０ｎｍの単色光に基づく△Ｎｘｙ・Ｄが２５～１００ｎｍで、Ｒｔｈが１００～３００ｎｍであり、かつ積層体面に対する法線とＮｚのなす角βが５～３０度であることを特徴とする複合位相差板。

【請求項２】　請求項１に記載の複合位相差板と偏光板の積層体からなることを特徴とする光学補償偏光板。

【請求項３】　請求項１に記載の複合位相差板を偏光板と液晶セルの間に有することを特徴とする液晶表示装置。

【請求項４】　請求項３において、複合位相差板が位相差層（Ａ）と位相差層（Ｃ）の間に位相差層（Ｂ）を有し、かつ位相差層の（Ａ）と（Ｂ）と（Ｃ）を各１層用いたものである液晶表示装置。

【発明の詳細な説明】

【０００１】

【発明の技術分野】本発明は、ＴＮ液晶による複屈折を高度に補償して視野角やコントラストに優れる液晶表示装置を形成しうる複合位相差板及び光学補償偏光板に関する。

【０００２】

【従来の技術】高速応答性や正面方向での高コントラスト性に着目されてＴＮ液晶を用いたＴＦＴ－ＬＣＤ（液晶表示装置）がテレビやパソコンモニタ等に広く普及する中、斜視方向でのコントラストの著しい低下や階調表示の反転（階調反転）等による良視認視野角の狭さの改善が求められており、高コントラスト化や広視野角化、視野角による表示色変化の抑制や画面表示の均一化が画面の大型化に伴い特に重要な課題となっている。

【０００３】従来、前記の改善策としては位相差板にてＴＮ液晶の複屈折による位相差を補償して視野角を拡大する提案がなされており、その視野角拡大用の補償板として光学軸傾斜のディスコティク液晶からなる負の屈折率異方性を示すワイドビューフィルム（商品名、富士写真フイルム社製）や光学軸傾斜のネマチック液晶からなる正の屈折率異方性を示すＮＨフィルム（商品名、日本石油化学社製）、正の複屈折特性を示すポリマーによる一軸延伸フィルムからなる位相差板をその光学軸が面内

2

にあるものと面に対して傾斜したものとの組合せでそれらの屈折率方向が直交するように積層した重畳型の補償板（特開平７－３０６４０６号公報、特開平７－３５９２４号公報、特開平１０－１２３５０６号公報、）が知られていた。

【０００４】しかしながら、前記のワイドビューフィルムでは正面方向から６０度以上傾斜した視野角でコントラストが著しく低下し、電圧を印加しない白表示状態で着色現象が発生する問題点があった。またＮＨフィルムでは電圧を印加した黒表示状態で視野角を変えると変色して黒色でなくなる問題点があった。さらに前記の重畳型補償板では視野角の変化で著しい着色現象が発生する問題点があった。従って従来の補償板ではＴＮ液晶の位相差特性に充分に対処できず、その視認特性の改善に満足できない問題点があった。

【０００５】

【発明の技術的課題】本発明は、大型画面の場合にもＴＮ液晶の複屈折による位相差を高度に補償できて階調反転しない視野角やコントラストに優れ、視野角による表示色変化の抑制や画面表示の均一性に優れる液晶表示装置を形成できる位相差板の開発を目的とする。

【０００６】

【課題の解決手段】本発明は、面内の屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚ、層厚をｄ、ｎｘ－ｎｙ＝△ｎｘｙ及び（ｎｘ－ｎｚ）／（ｎｘ－ｎｙ）＝Ｑとしたとき、（Ａ）ｎｘ＞ｎｙ＞ｎｚを満足する高分子フィルムからなる位相差層、（Ｂ）ｎｘ≧ｎｙ＞ｎｚを満足し光学軸が層平面の法線方向に対し傾斜する位相差層及び（Ｃ）ノルボルネン系ポリマーの配向フィルムからなり△ｎｘｙ・ｄ≦７０ｎｍ、１≦Ｑ≦４を満足する位相差層をそれぞれ１層又は２層以上有する積層体からなり、かつその積層体における面内の屈折率をＮｘ、Ｎｙ、厚さ方向の屈折率をＮｚ、厚さをＤとしてＮｘ≧Ｎｙ、（Ｎｘ－Ｎｙ）＝△Ｎｘｙ及び｛（Ｎｘ＋Ｎｙ）／２－Ｎｚ｝・Ｄ＝Ｒｔｈとしたとき、波長５９０ｎｍの単色光に基づく△Ｎｘｙ・Ｄが２５～１００ｎｍで、Ｒｔｈが１００～３００ｎｍであり、かつ積層体面に対する法線とＮｚのなす角βが５～３０度であることを特徴とする複合位相差板を提供するものである。

【０００７】また本発明は、前記の複合位相差板と偏光板の積層体からなることを特徴とする光学補償偏光板、及び前記の複合位相差板を偏光板と液晶セルの間に有することを特徴とする液晶表示装置を提供するものである。

【０００８】

【発明の効果】本発明によれば、上記した位相差層の（Ａ）、（Ｂ）、（Ｃ）を組合せた位相差の複合化による当該△Ｎｘｙ及びＲｔｈの位相差特性の達成により、ＴＮ液晶の複屈折による位相差を全方位角において高度に補償できる位相差板を得ることができ、大型画面の場合にも階調反転しない視野角が広くて視野角により表示色が

変化しにくく、コントラストや画面表示の均一性に優れる液晶表示装置を形成することができる。

【０００９】

【発明の実施形態】本発明による複合位相差板は、面内の屈折率をｎｘ、ｎｙ、厚さ方向の屈折率をｎｚ、層厚をｄ、ｎｘ－ｎｙ＝△ｎｘｙ及び（ｎｘ－ｎｚ）／（ｎｘ－ｎｙ）＝Ｑとしたとき、（Ａ）ｎｘ＞ｎｙ＞ｎｚを満足する高分子フィルムからなる位相差層、（Ｂ）ｎｘ≧ｎｙ＞ｎｚを満足し光学軸が層平面の法線方向に対し傾斜する位相差層、及び（Ｃ）ノルボルネン系ポリマーの配向フィルムからなり△ｎｘｙ・ｄ≦７０ｎｍ、１≦Ｑ≦４を満足する位相差層をそれぞれ１層又は２層以上有する積層体からなり、かつその積層体における面内の屈折率をＮｘ、Ｎｙ、厚さ方向の屈折率をＮｚ、厚さをＤとしてＮｘ≧Ｎｙ、（Ｎｘ－Ｎｙ）＝△Ｎｘｙ及び｛（Ｎｘ＋Ｎｙ）／２－Ｎｚ｝・Ｄ＝Ｒｔｈとしたとき、波長５９０ｎｍの単色光に基づく△Ｎｘｙ・Ｄが２５～１００ｎｍで、Ｒｔｈが１００～３００ｎｍであり、かつ積層体面に対する法線とＮｚのなす角βが５～３０度であるものからなる。

【００１０】前記複合位相差板の例を図１に示した。１が位相差層（Ａ）、（Ｂ）、（Ｃ）の積層体からなる複合位相差板であり、１１，１４が位相差層（Ａ）、１２，１５が位相差層（Ｂ）、１３，１６が位相差層（Ｃ）である。なお図は、液晶表示装置としたものを示しており、２が偏光板、３が液晶セルである。

【００１１】位相差層（Ａ）は、ｎｘ＞ｎｙ＞ｎｚを満足する高分子フィルム、すなわち面内に屈折率異方性を有して（ｎｘ＞ｎｙ）、その面内の屈折率よりも厚さ方向の屈折率が小さい屈折率特性（ｎｙ＞ｎｚ）を示す高分子フィルムにて形成される。補償効果の点より好ましい位相差層（Ａ）は、波長５９０ｎｍの単色光に基づく位相差：△ｎｘｙ・ｄが０超～５０ｎｍ以下であり、式：（ｎｘ＋ｎｙ）／２－ｎｚ｝・ｄで定義されるｒｔｈが３０～１００ｎｍである複屈折特性を示すものである。なお前記において、ｎｘ、ｎｙは面内の屈折率、ｎｚは厚さ方向の屈折率、ｄは層厚を意味し、△ｎｘｙ＝ｎｘ－ｎｙである（以下同じ）。

【００１２】高分子フィルムとしては、前記した屈折率特性を示す適宜な透明高分子からなるものを用いることができ、特に限定はない。ちなみにその例としては、各種のポリマーからなるフィルムやそのフィルムを一軸や二軸等の適宜な方式で延伸処理して高分子を配向させてなる延伸フィルムなどがあげられる。就中、光透過率に優れて配向ムラや位相差ムラの少ないものが好ましく用いうる。

【００１３】ちなみに前記高分子フィルムを形成するポリマーの具体例としては、ポリカーボネートやポリアリレート、ポリスルホンやポリオレフィン、ポリエチレンテレフタレートやポリエチレンナフタレート、ノルボルネン系ポリマーやアクリル系ポリマー、スチレン系ポリマーやセルロース系ポリマー、それらポリマーの２種又は３種以上を混合したポリマーなどがあげられる。

【００１４】また位相差層（Ａ）を高分子フィルムにて形成することにより、それに偏光フィルムの透明保護層を兼ねさせることができる。図１の例の如く複合位相差板１を形成する位相差層（Ａ）１１、１４に偏光フィルムの透明保護層を兼ねさせた状態で複合位相差板１と偏光板２を積層した光学補償偏光板とすることにより、その薄型化や製造プロセスの短縮化を図ることができる。

【００１５】位相差層（Ｂ）は、ｎｘ≧ｎｙ＞ｎｚ（負の屈折率異方性）を満足し、かつその光学軸が層平面の法線方向に対し傾斜するものにて形成される。これにより正の屈折率異方性を示すＴＮ液晶、特にその電圧印加による黒表示でのセル中におけるセル基板に対し光学軸が傾斜した状態に対する補償を効率よく行うことができる。位相差層（Ｂ）が負の屈折率異方性のみを満足して光学軸が層平面の法線方向に対し傾斜する条件を満足しない場合には本発明の目的を達成することができない。

【００１６】すなわち負の屈折率異方性のみを満足する位相差層では、その法線方向を基準（入射角０度）として単色光の入射角を基準から面内の最大屈折率方向に傾けるとその△ｎｘｙ・ｄは、０度入射の場合を最大値としてそれを中心に対称形をなし、入射角を面内最大屈折率方位に直交する方向に傾けたときはその△ｎｘｙ・ｄが０度入射の場合を最小値としてそれを中心に対称形をなして、補償効果に不足する。

【００１７】前記に対し光学軸が法線より傾斜する特性を付加することで、０度入射のときに△ｎｘｙ・ｄが最大値及び最小値となることを回避できて補償効果の向上を図ることができる。なお負の屈折率異方性の傾斜タイプがハイブリッド配向をなす場合には△ｎｘｙ・ｄの最小値が０となることはないが、チルト配向をなす場合には△ｎｘｙ・ｄの最小値が０となるときもある。

【００１８】上記特性を示す位相差層（Ｂ）の形成は、例えば熱可塑性ポリマーからなるフィルムを周速の異なるロールで圧延処理する方式、液晶ポリマーを電場や磁場等の印加下に、あるいは配向膜等を介して配向させる方式などの適宜な方式により分子が層面に対し傾斜配向したものとして形成することができる。

【００１９】なお前記の熱可塑性ポリマーとしては上記の位相差層（Ａ）で例示したものなどの適宜なものを用いることができる。また液晶ポリマーとしては、ディスコチィク系やネマチック系、コレステリック系やスメクチック系のものなどの適宜なものを１種又は２種以上を用いることができる。就中、傾斜配向の処理性などの点より上記したワイドビューフィルムにおける如きディスコチィク液晶ポリマーが好ましく用いうる。

【００２０】位相差層（Ｃ）は、ノルボルネン系ポリマーの配向フィルムからなり、△ｎｘｙ・ｄ≦７０ｎｍ、１≦Ｑ≦４を満足するものにて形成される。なおＱ＝（ｎｘ

－ｎｚ）／（ｎｘ－ｎｙ）である（以下同じ）。かかる位相差層（Ｃ）の形成は、例えばノルボルネン系ポリマーフィルムをテンター等を介しガラス転移温度よりも３０～６０℃高い温度で幅方向に１．１～３倍の倍率で一軸延伸する方法などにより行うことができる。位相差層（Ｃ）を形成するノルボルネン系ポリマーについては特に限定はなく、市販物等の適宜なものを単独で又は２種以上を混合して用いうる。

【００２１】複合位相差板の形成は、積層体における面内の屈折率をＮｘ、Ｎｙ、厚さ方向の屈折率をＮｚ、厚さをＤとしてＮｘ≧Ｎｙ、（Ｎｘ－Ｎｙ）＝△Ｎｘｙ及び｛（Ｎｘ＋Ｎｙ）／２－Ｎｚ｝・Ｄ＝Ｒｔｈとしたとき、波長５９０ｎｍの単色光に基づく△Ｎｘｙ・Ｄが２５～１００ｎｍで、かつＲｔｈが１００～３００ｎｍとなる組合せで上記した位相差層の（Ａ）と（Ｂ）と（Ｃ）を、積層体面に対する法線とＮｚのなす角βが５～３０度となるように積層することにより行うことができる。その積層に際しては前記Ａ、Ｂ、Ｃの各位相差層をそれぞれ１層又は２層以上用いうる。

【００２２】前記の△ＮｘｙとＲｔｈを満足することで法線（正面方向）に対し略８０度の全方位角で表示色の変化なしに良好なコントラストを示すＴＮ型液晶表示装置を形成することも可能である。複合位相差板における前記△ＮｘｙとＲｔｈの制御は、位相差層の（Ａ）、（Ｂ）、（Ｃ）の組合せやその組合せ数を変えることにより行うことができる。

【００２３】位相差層の（Ａ）、（Ｂ）、（Ｃ）の積層においてそれらの遅相軸ないし進相軸の配置角度や配置順序は任意であり、その配置角度の制御にても前記の△ＮｘｙやＲｔｈを調節することができる。補償効果の点より有利な積層は、位相差層（Ｂ）の光学軸の傾斜方向と積層体面内の最大屈折率方向が可及的に直交状態（９０度）となるように交差させたものである。

【００２４】また前記の補償効果を達成しつつ複合位相差板の薄型化を図る点より有利な積層は、位相差層の（Ａ）と（Ｂ）と（Ｃ）を各１層用いてそれらを位相差層の（Ｂ）が（Ａ）と（Ｃ）の間に位置するように積層したものである。なお位相差層の積層に際しては粘着剤等の適宜な接着剤を用いることができ、液晶ポリマー層では位相差層（Ａ）等にて接着支持することも可能である。

【００２５】上記の如く位相差層の（Ａ）、（Ｂ）、（Ｃ）の組合せによる複合化にて新たな位相差特性を付与できて、ＴＮ液晶の複屈折による位相差やその視角による変化等を補償しうる各種の位相差特性を示す豊富な位相差板を得ることができ、ＴＮ液晶の配向状態等の違いによる複屈折特性の相違に対しても高精度に補償することができる。

【００２６】すなわち従来の上記したワイドビューフィルムやＮＨフィルムの如く位相差層の（Ａ）と（Ｂ）のみでは、例えば６０度以上の視野角でのコントラストが大きく低下する点や白表示で着色が発生する点、あるいは黒表示で変色して黒色でなくなる点などの補償効果に不足する点を位相差層（Ｃ）を補って少なくとも当該３層の位相差層にて補償することにより、広い視野角でコントラストや表示色変化の低さ等に優れるＴＮ型液晶表示装置を得ることができる。

【００２７】なお位相差層の（Ａ）、（Ｂ）、（Ｃ）の厚さは、目的とする位相差特性などに応じて適宜に決定することができる。一般には高分子フィルムからなる場合、１～５００μｍ、就中３～３５０μｍ、特に５～２５０μｍ、液晶ポリマー層の場合には１００μｍ以下、就中２０μｍ以下、特に０．１～１０μｍの厚さとされるが、これに限定されない。

【００２８】本発明による複合位相差板は、そのまま実用に供することもできるし、図例の如く偏光板２と積層して光学補償偏光板として実用に供することもできる。その光学補償偏光板の形成には、適宜な偏光板を用いることができ、その種類について特に限定はない。就中、所定振動面の直線偏光を透過し、他の光は吸収する特性を示す吸収型の偏光板が高い偏光度の点などより好ましく用いうる。

【００２９】ちなみに前記偏光板の例としては、ポリビニルアルコール系や部分ホルマール化ポリビニルアルコール系、エチレン・酢酸ビニル共重合体系部分ケン化物の如き親水性高分子のフィルムにヨウ素及び／又は二色性染料等の二色性物質を吸着させて延伸配向処理した偏光フィルムやポリエン配向の偏光フィルムなどが用いられる。

【００３０】また偏光板は、偏光フィルムの片面又は両面に透明保護層を設けたものなどであってもよい。透明保護層は、偏光フィルムの補強、耐熱性や耐湿性の向上などの種々の目的で設けられる。透明保護層は、樹脂の塗布層や樹脂フィルムのラミネート層などとして形成でき、拡散化や粗面化用等の微粒子を含有していてもよい。また透明保護層は、上記した如く位相差層（Ａ）として設けられていてもよい。

【００３１】前記の場合には、図例の如く本発明による複合位相差板を形成する位相差層（Ａ）１１，１４が偏光板２における偏光フィルムの片側の透明保護層を兼ねることとなり、光学補償偏光板の薄型化や液晶表示装置の組立効率の向上に有利である。なお複合位相差板とは別体に設けた透明保護層が位相差を示す場合、複合位相差板は少なくともそれに近接する透明保護層を加えた状態での特性として上記した△ＮｘｙとＲｔｈを満足することが補償効果等の点より好ましい。

【００３２】用いる偏光板はさらに、特に複合位相差板を設けない側に表面反射の防止などを目的に反射防止層や防眩処理層が設けられたものであってもよい。反射防止層は、例えばフッ素系ポリマーのコート層や多層金属

蒸着膜等の光干渉性の膜などとして適宜に形成することができる。一方、防眩処理層も、例えば微粒子含有の樹脂塗工層やエンボス加工、サンドブラスト加工やエッチング加工等の適宜な方式で表面に微細凹凸構造を付与するなどにより表面反射光が拡散する適宜な方式で形成したものであってよい。

【００３３】なお前記の微粒子には、例えば平均粒径が０．５～２０μmのシリカや酸化カルシウム、アルミナやチタニア、ジルコニアや酸化錫、酸化インジウムや酸化カドミウム、酸化アンチモン等の導電性のこともある無機系微粒子や、ポリメチルメタクリレートやポリウレタの如き適宜なポリマーからなる架橋又は未架橋の有機系微粒子などの適宜なものを１種又は２種以上用いうる。

【００３４】光学補償偏光板における複合位相差板の進相軸等と偏光板の透過軸等との配置関係については特に限定はなく、適宜に決定することができる。一般には偏光板の透過軸と複合位相差板の面内最大屈折方向を平行関係又は直交関係に配置することが、正面（垂直）方向の特性には影響を与えずに視角が変化する斜め方向の特性を制御して視野角の拡大等を図る点より好ましい。

【００３５】本発明による複合位相差板や光学補償偏光板を形成する位相差層や偏光板等の各層は、分離状態にあってもよいが、層間の屈折率差調節による反射の抑制や光学系のズレ防止、ゴミ等の異物の侵入防止などの点よりその一部、就中、全部が固着処理されていることが好ましい。

【００３６】前記の固着処理には、例えば透明な接着剤などの適宜なものを用いることができ、接着剤等の種類について特に限定はない。構成部材の光学特性の変化防止などの点より、接着処理時の硬化や乾燥の際に高温のプロセスを要しないものが好ましく、長時間の硬化処理や乾燥時間を要しないものが望ましい。かかる点よりは粘着層が好ましく用いうる。

【００３７】粘着層の形成には、例えばアクリル系重合体やシリコーン系ポリマー、ポリエステルやポリウレタン、ポリエーテルや合成ゴムなどの適宜なポリマーを用いてなる透明粘着剤を用いることができる。就中、光学的透明性や粘着特性、耐候性などの点よりアクリル系粘着剤が好ましい。

【００３８】なお粘着層は、液晶セル等の被着体への接着を目的に複合位相差板や光学補償偏光板等の片面又は両面に必要に応じて設けることもできる。粘着層が表面に露出する場合には、それを実用に供するまでの間、セパレータなどを仮着して粘着層表面の汚染等を防止することが好ましい。

【００３９】本発明による複合位相差板や光学補償偏光板は、液晶、特にＴＮ液晶による複屈折に対する補償板などとして液晶表示装置の形成に好ましく用いうる。液晶表示装置は一般に、偏光板や液晶セルや補償板、必要に応じてのバックライトや反射板等の構成部品を適宜に組立てて駆動回路を組込むことなどにより形成されるが、本発明においては上記した複合位相差板や光学補償偏光板を用いる点を除いて特に限定はなく、従来に準じて液晶表示装置を形成することができる。

【００４０】従って液晶表示装置の形成に際しては、例えば視認側の偏光板の上に設ける光拡散板やアンチグレア層やプリズムシート、反射防止膜や保護層や保護板、バックライトに設けるプリズムシート等の光路制御板などの適宜な光学素子を適宜に配置することができる。なお補償板は通例、図例の如く液晶セル３と視認側又は／及びバックライト側の偏光板２との間に配置される。従って本発明による複合位相差板又は光学補償偏光板は、液晶セルの少なくとも片側に配置されていればよい。

【００４１】

【実施例】実施例１

厚さ１００μmのノルボルネン系ポリマーフィルム（ＪＳＲ社製、アートン、以下同じ）をテンター延伸機にて１７５℃で延伸処理して、ｎｘ＞ｎｙ＞ｎｚの屈折率特性を有して、波長５９０nmの単色光による（以下同じ）△ｎｘｙ・ｄが１０nmで、ｒthが８０nmの位相差層Ａ１を得た。なお屈折率等は、自動複屈折計（王子計測機器社製、ＫＯＢＲＡ－２１ＡＤＨ、以下同じ）にて測定した。

【００４２】次に前記の位相差層Ａ１の上に、加湿処理下に接着剤を介し移着させる方式でワイドビューフィルム（ＷＶ０２Ａ）のディスコチック液晶ポリマーの傾斜配向層のみを転写して位相差層Ｂ１を積層し、波長５９０nmの単色光による△ｎｘｙ・ｄが３０nmで、ｒthが１３０nmの積層体を得た。なお転写積層に際しては、位相差層Ａ１の面内最大屈折率（ｎｘ）の方向とディスコチック液晶の傾斜方向とが平行になるように処理した。

【００４３】ついで前記の位相差層Ｂ１の上に、厚さ１００μmのノルボルネン系ポリマーフィルムをテンターにて２１０℃で一軸延伸処理して得た波長５９０nmの単色光による△ｎｘｙ・ｄが２０nmで、Ｑが１．６の位相差層Ｃ１をアクリル系粘着層を介し積層し、波長５９０nmの単色光による△Ｎｘｙ・Ｄが５０nmで、Ｒthが１６０nmの複合位相差板を得た。

【００４４】次に厚さ７５μmのポリビニルアルコールフィルムをヨウ素を含む水溶液中で染色した後、ホウ酸を含む水溶液中で周速の異なるロール間にて６倍に一軸延伸して得た偏光フィルムの片面にポリビニルアルコール系接着剤を介し厚さ８０μmのトリアセチルセルロースフィルムを接着し、偏光フィルムの他面にポリビニルアルコール系接着剤を介し前記の複合位相差板をその位相差層Ａ１を介し接着積層して光学補償偏光板を得た。

【００４５】比較例

複合位相差板に代えて、上記した位相差層Ａ１と位相差層Ｂ１との積層体を用いてその位相差層Ａ１を介し接着

積層したほかは実施例１に準じて光学補償偏光板を得た。

【００４６】評価試験

実施例１及び比較例で得た光学補償偏光板をＴＮ型液晶セルの両面に偏光板が外側となるように接着して液晶表示装置を得、コントラスト測定器（ＥＬＤＩＭ社製、ＥＺContrast）にてその表示コントラストの視野角特性を＊調べた。その結果を、等コントラスト曲線にて図２に示した。また上下左右方向のコントラスト１０基準の視野角特性を次表に示した。以上の結果より、実施例においてはほぼ全方位において良視認の視野角が大きく拡大されていることがわかる。

【００４７】

	上方向	下方向	左方向	右方向
実施例１	８０度以上	５０度	８０度以上	８０度以上
比較例	５２度	５２度	６０度	６３度

【図面の簡単な説明】

【図１】液晶表示装置例の断面図

【図２】実施例１及び比較例の等コントラスト曲線

【符号の説明】

１：複合位相差板

※※１１，１４：位相差層（Ａ）

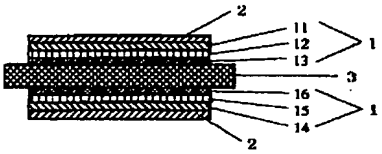
１２，１５：位相差層（Ｂ）

１３，１６：位相差層（Ｃ）

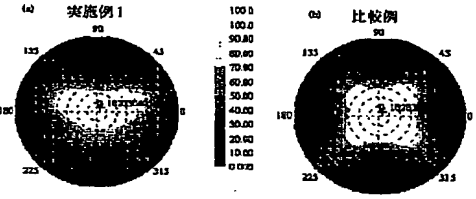
２：偏光板

３：液晶セル

【図１】



【図２】



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